CHAPTER 80
APPLICATION OF DESIGN STANDARDS

Topic 81 - Project Development Overview

Index 81.1 - Philosophy

The Project Development process seeks to provide a degree of mobility to users of the transportation system that is in balance with other values. In the development of transportation projects, social, economic, and environmental effects must be considered fully along with technical issues so that final decisions are made in the best overall public interest. Attention should be given to such considerations as:

(a) Need for safe and efficient transportation for all users (motorists, bicyclists, transit riders, and pedestrians) of the facility and transportation modes.

(b) Attainment of community goals and objectives.

(c) Needs of low mobility and disadvantaged groups.

(d) Costs and benefits of eliminating or minimizing adverse effects on natural resources, environmental values, public services, aesthetic values, and community and individual integrity.

(e) Planning based on realistic financial estimates.

(f) The cost, ease, and safety of maintaining whatever is built.

Proper consideration of these items requires that a facility be viewed from the perspectives of the user, the nearby community, and larger statewide interests. For the user, efficient travel, mode selection, and safety are paramount concerns. At the same time, the community often is more concerned about local aesthetic, social, and economic impacts. The general population, however, tends to be interested in how successfully a project functions as part of the overall transportation system and how large a share of available capital resources it consumes. Therefore, individual projects must be for construction on the basis of overall system benefits as well as community goals, plans, and values.

Decisions must also emphasize the connectivity between the different transportation modes so that they work together effectively.

The goal is to increase person and goods throughput, highway mobility and safety in a manner that is compatible with, or which enhances, adjacent community values and plans.

81.2 Highway Context

The context of a highway is a critical factor when developing the purpose and need statement for a project in addition to making fundamental design decisions such as its typical cross section, and when selecting the design elements and aesthetic features such as street furniture and construction materials. Designing a highway that is sensitive to, and respectful of, the surrounding context is critical for project success in the minds of the Department and our stakeholders.

A “one-size-fits-all” design philosophy is not departmental policy. Designers need to be aware of and sensitive to land use, community context and the associated user needs of the facility. In some instances, the design criteria and standards in this manual are based on the land use contexts in which the State highway is located, for instance: large population areas and downtowns in urban areas, small rural towns and communities, suburban commercial/residential corridors, and rural corridors. This approach ensures the standards are flexible plus allow and encourage methods to minimize impacts on scenic, historic, archaeological, environmental, and other important resources.

Beyond their intended transportation benefits, State highways can significantly impact the civic, social and economic conditions of local communities. Designing transportation facilities that integrate the local transportation and land uses while making the design responsive to the other needs of the community support the livability of the community and are usually a complementary goal to meeting the transportation needs of the users of the State highway system.

To do this successfully, the designer needs to have an understanding of the area surrounding the highway and the users of the highway, its function within the regional and State transportation systems, (which includes all transportation modes), and the level of access control needed. To gain this understanding, the designer must work with the Transportation Planners in the Region or District.

A Main Street design is not a place type but a design philosophy to be applied though a community. A main street design serves pedestrians, bicyclists, businesses and public transit with motorized traffic traveling at speeds of 20 to 40 miles per hour. See the Department's Main Streets Guide for more information.

In this manual, the following concepts are used to discuss the context of a highway:

- Place Type – the surrounding built and natural environment;
- Type of Highway - the role the highway plays in terms of providing regional or interregional connectivity and local access; and,
- Access Control - the degree of connection or separation between the highway and the surrounding land use.

81.3 Place Types

A place type describes the area's physical environment and the land uses surrounding the State highway. The place types described below are intentionally broad. Place types should be agreed upon in partnership with all of the project stakeholders; however, there likely may be more than one place type within the limits of a project. Ultimately, the place types selected can be used to determine the appropriate application of the guidance provided in this manual.

Identifying the appropriate place type(s) involves discussions with the project sponsors, ideally through the Project Development Team (PDT) process, and requires coordination with the land use planning activities associated with the on-going local and regional planning activities. Extensive community engagement throughout both the project planning and project development processes helps to formulate context sensitive project alternatives and transportation facilities that coordinate with the local land uses.

The following place types are used in this manual:

(1) Rural Areas. Rural areas are typically sparsely settled and developed. They can consist of protected federal and State lands, agricultural lands, and may include tourist and recreational destinations. However, as rural lands transition into rural communities, they can become more developed and suburban and urban-like by providing for a mixture of housing, commercial, industrial and public institutions. For the use of this manual, rural areas have been subcategorized as Natural Corridors, Developing Corridors and City/Town Centers (Rural Main Streets).

(a) Natural Corridors. Typically, the desire in these corridors is to preserve the natural and scenic countryside while at the same time provide transportation services to support the travel and tourism that occurs when visiting these locations. Examples of this place type are: National/State Forests and Parklands; agricultural lands with scattered farm buildings and residences; and, low density development. See Topic 109 for additional information

(b) Developing Corridors. State highways traveling through these lands tend to be increasingly clustered with industrial, commercial, and residential areas as they lead into a rural city or town center. These locations can be in transition. Highways associated with these locations help to deliver tourists, but they also need to support the local communities and their local economies. In addition, these highways also serve a role and should be efficient at moving people and goods between regions.

Industrial, commercial and retail buildings tend to be located separately from housing and are typically set back from the highway with parking areas placed in front. Truck traffic on these highways tends to serve the needs of these industrial, commercial and retail buildings; however, there will be a

component of the truck traffic that is transporting their loads inter-regionally.

(c) City or Town Centers (Rural Main Streets). State highways in this scenario are usually a main street through the rural city or town, or they may be the only main street. The use of the State highway in this environment varies depending upon the individual community, as does the mix of buildings, services, businesses, and public spaces. Transit is often present and should be incorporated into the transportation system as appropriate. Transportation improvement projects on these main street highways can be more complicated and costly than similar projects in more rural settings. A balance usually needs to be maintained between the needs of the through traffic and those of the local main street. Thus, analyzing the pedestrian and bicyclist needs early in the development of the project and then following through on the agreements during the design of highway projects in these locations can be especially important. Accommodating the pedestrian and bicyclist needs concurrently in projects leads to greater efficiency in the use of funding.

(2) Suburban Areas. Suburban areas lead into and can completely surround urban areas. A mixture of land uses is typical in suburban areas. This land use mixture can consist of housing, retail businesses and services, and may include regional centers such as shopping malls and other similar regional destinations; which are usually associated with suburban communities (cities and towns) that are connected with larger urban centers and cities. Analyzing the needs of pedestrians, bicyclists, and transit users in concert with the vehicular needs of motorists and truck drivers is necessary during the project planning, development and design of highway projects in these locations. Accommodating all of these needs concurrently into a project leads to greater efficiency in the use of funding. For the use of this manual, suburban areas have been categorized as either Lower Density/Residential Neighborhoods or Higher Density/Regional Community Centers (Suburban Main Streets).

(a) Lower Density / Residential Neighborhoods. Conventional State highways typically do not cross through this place type. This place type usually feeds users onto the State highway system and is typically under the jurisdiction of a local entity. State highways, if they do interact with this place type, usually just connect at the edges of them where the pedestrians, bicyclists, and motor vehicle operators integrate into the highway system that includes transit facilities.

(b) Higher Density / Regional Community Centers (Suburban Main Streets). As suburban areas grow they tend to merge together into each other's boundaries. Growth in some locations can create "Megacommunities." While these super areas seem to function as individual cities, they typically have multiple distinct community centers that require highways with the capacity to serve not only each center, but the center-to-center traveler needs. These areas typically require the State highway to serve not only the originally urbanized area, but also the newer suburban areas that have been created where the housing, shopping and employment opportunities are all centered. Anticipating and accommodating growth in this place type can be a challenge. State and local governments, the business community and citizens groups, and metropolitan planning organizations all need to agree on how to meet the community needs, and at times the interregional needs of the highway.

(3) Urban and Urbanized Areas. Urban areas generally are the major population centers in the State. Large numbers of people live in these urbanized areas and this growth is expected to continue. Bicycling, transit, and walking are important transportation modes in these areas and as the facilities for pedestrians, transit and bicyclists expand in these areas, the percentage and number of travelers walking,

using transit and bicycling is also likely to increase. State agencies and the local governmental entities, the business community and citizens groups, congestion Management Agencies and the local/regional metropolitan planning organization (MPO) need to all agree upon the concept of the transportation facilities being provided so that the community needs can be met.

Urban areas are typically high-density locations such as central business districts, downtown communities, and major activity centers. They have a full range of land uses and are associated with a large diversity of activities. For the use of this manual, urban areas have been categorized as Lower Density Parklands and Residential Neighborhoods and Higher Density Urban Main Streets. Higher Density Urban Main Streets have been further characterized as Community Centers and Downtown Cores.

(a) Lower Density Parklands and Residential Neighborhoods. Large numbers of people live in these urbanized areas and bicycling, transit and walking are important transportation modes in these areas. Parklands can enhance these neighborhoods and parkland preservation is a concern, as well as, access to support travel and tourism to the parklands.

(b) High Density Urban Main Streets.

- Community Centers or Corridor. Strategically improving the design and function of the existing State highways that cross these centers is typically a concern. Providing transportation options to enhancing these urban neighborhoods that combine highway, transit, passenger rail, walking, and biking options are desirable. In some locations, the State highway is the community corridor and needs to support tourism and shopping.

- Downtown Cores. Similar to community centers, much of the transportation system has already been built and its footprint in the community needs to be preserved while its use may need to be reallocated. Successfully meeting the metropolitan mobility needs of a major metropolitan downtown core area requires a balanced approach. Such an approach is typically used to enhance the existing transportation network's performance by adding capacity to the highways, sidewalks, and transit stations for all of the users of the system, and/or adding such enhancement features as HOV lanes, BRT, walkable corridors, etc. Right of way is limited and costly to purchase in these locations. Delivery truck traffic that supports the downtown core businesses can also create problems.

81.4 Type of Highway

Much of the following terminology is either already discussed in Chapter 20 or defined in Topic 62. The additional information in this portion of the manual is being provided to connect these terms with the guidance that is being provided.

(1) Functional Classification. One of the first steps in the highway design process is to define the function that the facility is to serve. The two major considerations in functionally classifying a highway are access and throughput. Access and mobility are inversely related; as access is increased, mobility decreases. In the AASHTO "A Policy on Geometric Design of Highways and Streets", highways are functionally classified first as either urban or rural. The hierarchy of the functional highway system within either an urban or rural area consists of the following:

- Principal arterial - main movement (high mobility, limited access) Typically 4 lanes or more;

- Minor arterial - interconnects principal arterials (moderate mobility, limited access) Typically 2 or 3 lanes with turn lanes to benefit through traffic;

- Collectors - connects local roads to arterials (moderate mobility, moderate access) with few businesses; and,
- Local roads and streets - permits access to abutting land (high access, limited mobility).
- The California Road System (CRS) maps are the official functional classification maps approved by Federal highway Administration. These maps show urban/rural boundaries and functional classification of roads.

(2) *Interstate Highways.* The interstate highway system was originally designed to be high-speed interregional connectors and it is a portion of the National Highway System (NHS). In urban and suburban areas, a large percentage of vehicular traffic is carried on the interstate highway system, rather than on the local arterials and streets.

(3) *State Routes.* The State highway system is described in the California Streets and Highway Code, Division 1, Chapter 2 and they are further defined in this manual in Topic 62.3, Highway Types which provides definitions for freeways, expressways, and highways.

81.5 Access Control

Index 62.3 defines a controlled access highway and a conventional highway. The level of access control plays a part in determining the design standards that are to be utilized when designing a highway. See Index 405.6 for additional access control guidance.

81.6 Design Standards and Highway Context

The design guidance and standards in this manual have been developed with the intent of ensuring that:

- Designers have the ability to design for all modes of travel (vehicular, bicycle, pedestrian and transit); and also to,
- Provide flexibility to allow designers the ability to tailor a project to the unique circumstances that relate to it and its location, while meeting driver expectation.

Designers should balance the interregional transportation needs with the needs of the communities they pass through. The design of projects should, when possible, expand the options for biking, walking, and transit use. In planning and designing projects, the project development team should work with locals that have any livable policies as revitalizing urban centers, building local economies, and preserving historic sites and scenic country roads. The "Main Streets: Flexibility in Planning, Design and Operations" published by the Department should be consulted for additional guidance as should the FHWA publication "Flexibility in Highway Design".

Early consultation and discussion with the Design Coordinator and the Design Reviewer during the project initiation document (PID) phase is also necessary to avoid issues that may arise later in the project development process. Design Information Bulletin 78 "Design Checklist for the Development of Geometric Plans" is a tool that can be used to identify and discuss design features that may deviate from standard.

Topic 82 - Application of Standards

82.1 Highway Design Manual Standards

(1) *General.* The highway design criteria and policies in this manual provide a guide for the engineer to exercise sound judgment in applying standards, consistent with the above Project Development philosophy, in the design of projects. This guidance allows for flexibility in applying design standards and approving design exceptions that take the context of the project location into consideration; which enables the designer to tailor the design, as appropriate, for the specific circumstances while maintaining safety.

The design standards used for any project should equal or exceed the minimum given in the Manual to the maximum extent feasible, taking into account costs (initial and life-

cycle), traffic volumes, traffic and safety benefits, right of way, socio-economic and environmental impacts, maintenance, etc. Because design standards have evolved over many years, many existing highways do not conform fully to current standards. It is not intended that current manual standards be applied retroactively to all existing State highways; such is neither warranted nor economically feasible. However, when warranted, upgrading of existing roadway features such as guardrail, lighting, superelevation, roadbed width, etc., should be considered, either as independent projects or as part of larger projects. A record of the decision not to upgrade the existing non-standard mandatory or advisory features shall be provided through the exception process (See Index 82.2).

This manual does not address temporary construction features. It is recognized that the construction conditions encountered are so diverse and variable that it is not practical to set geometric criteria. Guidance for use of traffic control devices for temporary construction zones can be found in Part 6 – Temporary Traffic Control of the California Manual on Uniform Traffic Control Devices (California MUTCD). Guidance for the engineering of pavements in temporary construction zones is available in Index 612.6.

In this manual, design standards are categorized in order of importance in development of a safe State highway system operating at selected levels of service commensurate with projected traffic volumes and highway classification. See also Index 82.4 for other mandatory procedural requirements.

(2) Mandatory Standards. Mandatory design standards are those considered most essential to achievement of overall design objectives. Many pertain to requirements of law or regulations such as those embodied in the FHWA's 13 controlling criteria (see subsection (5) below). Mandatory standards use the word "shall" and are printed in **Boldface** type (see Table 82.1A).

(3) Advisory Standards. Advisory design standards are important also, but allow greater flexibility in application to accommodate design constraints or be compatible with local conditions on resurfacing or rehabilitation projects. Advisory standards use the word "should" and are indicated by Underlining (see Table 82.1B).

(4) Permissive Standards. Permissive standards are all text other than those that discuss mandatory or advisory standards, where the words "should" or "may" are used. Not all permissive standards are at the engineer's discretion, are some standard that are absolute (without exception) and are indicated by use of the word "must" or statements of fact are indicated by the words "will" , "are" or "is".

(5) Controlling Criteria. The FHWA has designated thirteen controlling criteria for selection of design standards of primary importance for highway safety, listed as follows: design speed, lane width, shoulder width, bridge width, horizontal alignment, vertical alignment, grade, stopping sight distance, cross slope, superelevation, horizontal clearance, vertical clearance and bridge structural capacity. All but the last of these criteria are also designated as geometric criteria.

The design standards related to the 12 geometric criteria are designated as mandatory standards in this manual (see Index 82.1(2) and Table 82.1A).

(6) Other. In addition to the design standards in this manual, the Traffic Manual contains standards relating to clearzone, signs, delineation, barrier systems, signals, and lighting.

Caution must be exercised when using other Caltrans publications which provide guidelines for the design of highway facilities, such as HOV lanes. These publications do not contain design standards; moreover, the designs suggested in these publications do not always meet Highway Design Manual Standards. Therefore, all other Caltrans publications must be used in conjunction with this manual.

82.2 Approvals for Nonstandard Design

(1) Mandatory Standards. To promote uniform practice on a statewide basis, design features or elements which deviate from most mandatory standards indicated herein require the approval of the Chief, Division of Design. This approval authority has been delegated to the Design Coordinators, except the mandatory standards in Chapters 600 through 670, which have been delegated to the State Pavement Engineer, and may involve coordination with the Design Coordinator.

The current procedures and documentation requirements pertaining to the approval process for those exceptions to mandatory design standards are contained in Chapter 21 of the Project Development Procedures Manual (PDPM).

Design exception approval must be obtained pursuant to the instructions in PDPM Chapter 9.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) allowed significant delegation to the states by FHWA to approve and administer portions of the Federal-Aid Transportation Program. SAFETEA-LU further allowed delegation to the State DOT's and in response to this a Joint Stewardship and Oversight Agreement (JSOA) document between FHWA and Caltrans was signed. The JSOA outlines the process to determine specific project related delegation to the Department. The JSOA requires, FHWA approval of exceptions to mandatory design standards related to the 13 controlling criteria on all Interstate projects whether FHWA has oversight responsibilities or not. FHWA approval should be sought as early in the project development process as possible. However, formal approval shall not be requested until the appropriate Design Coordinator has approved the design exception.

FHWA approval is not required for exceptions to "Caltrans-only" mandatory standards. Table 82.1A identifies these mandatory standards.

For local facilities crossing the State right of way see Index 308.1.

(2) Advisory Standards. The authority to approve exceptions to advisory standards has been delegated to the District Directors. Proposals for exceptions from advisory standards should be discussed with the Design Coordinators during development of the approval documentation. The responsibility for the establishment of procedures for review, documentation, and long term retention of approved exceptions from advisory standards has also been delegated to the District Directors.

82.3 Use of FHWA and AASHTO Standards and Policies

The standards in this manual generally conform to the standards and policies set forth in the AASHTO publications, "A Policy on Geometric Design of Highways and Streets" (2004) and "A Policy on Design Standards-Interstate System" (2005). A third AASHTO publication, "Roadside Design Guide" (2002), focuses on creating safer roadsides. These three documents, along with other AASHTO and FHWA publications cited in 23 CFR Ch 1, Part 625, Appendix A, contain most of the current AASHTO policies and standards, and are approved references to be used in conjunction with this manual.

AASHTO policies and standards, which are established as nationwide standards, do not always satisfy California conditions. When standards differ, the instructions in this manual govern, except when necessary for FHWA project approval (Index 108.3, Coordination with the FHWA).

82.4 Mandatory Procedural Requirements

Required procedures and policies for which Caltrans is responsible, relating to project clearances, permits, licenses, required tests, documentation, value engineering, etc., are indicated by use of the word "must". Procedures and actions to be performed by others (subject to notification by Caltrans), or statements of fact are indicated by the word "will".

82.5 Effective Date for Implementing Revisions to Design Standards

Revisions to design standards will be issued with a stated effective date. It is understood that all projects will be designed to current standards unless an exception has been approved in accordance with Index 82.2.

On projects where the project development process has started, the following conditions on the effective date of the new or revised standards will be applied:

- For all projects where the PS&E has not been finalized, the new or revised design standards shall be incorporated unless this would impose a significant delay in the project schedule or a significant increase in the project engineering or construction costs. The Design Coordinator or individual delegated authority will make the final determination on whether to apply the new or previous design standards on a project-by-project basis for roadway features.
- For all projects where the PS&E has been submitted to Headquarters Office Engineer for advertising or the project is under construction, the new or revised standards will be incorporated only if they are identified in the Change Transmittal as requiring special implementation.

For locally-sponsored projects, the Oversight Engineer must inform the funding sponsor within 15 working days of the effective date of any changes in mandatory or advisory design standards as defined in Index 82.2.

82.6 Design Information Bulletins and Other Guidance

In addition to the design standards in this manual, Design Information Bulletins (DIBs) establish policies and procedures for the various design specialties of the Department that are in the Division of Design. Some DIBs may eventually become part of this manual, while others are written with the intention to remain as design guidance in the DIB format. References to DIBs are made in this manual by the "base" DIB number only and considered to be the latest version available on the Department Design website. See the Department Design website for further information concerning DIB numbering protocol and postings.

Caution must be exercised when using other Caltrans publications, which provide guidelines for the design of highway facilities, such as HOV lanes. These publications do not contain design standards; moreover, the designs suggested in these publications do not always meet Highway Design Manual Standards. Therefore, all other Caltrans publications must be used in conjunction with this manual.

Table 82.1A
Mandatory Standards

CHAPTER 100 BASIC DESIGN POLICIES

Topic 101 Design Speed

Index 101.1 Technical Reductions of Design Speed

101.1 Selection of Design Speed - Local Facilities

101.1 Selection of Design Speed - Local Facilities - with Connections to State Facilities

101.2 Design Speed Standards

Topic 104 Control of Access

Index 104.4 Protection of Access Rights(1)

CHAPTER 200 GEOMETRIC DESIGN AND STRUCTURE STANDARDS

Topic 201 Sight Distance

Index 201.1 Stopping Sight Distance Standards

Topic 202 Superelevation

Index 202.2 Standards for Superelevation

202.7 Superelevation on City Streets and County Roads

Topic 203 Horizontal Alignment

Index 203.1 Horizontal Alignment - Local Facilities

203.1 Horizontal Alignment and Stopping Sight Distance

203.2 Standards for Curvature – Minimum Radius

203.2 Standards for Curvature – Lateral Clearance

Topic 204 Grade

Index 204.1 Standards for Grade - Local Facilities

204.3 Standards for Grade

204.8 Vertical Falsework Clearances(1)

Topic 205 Road Connections and Driveways

Index 205.1 Sight Distance Requirements for Access Openings on Expressways

Topic 208 Bridges, Grade Separation Structures, and Structure Approach Embankment

Index 208.1 Bridge Width

208.4 Bridge Sidewalk (Width)

208.10 Barriers on Structures with Sidewalks

208.10 Bridge Approach Railings(1)

CHAPTER 300 GEOMETRIC CROSS SECTION

Topic 301 Traveled Way Standards

Index 301.1 Lane Width – State Facility

301.1 Lane Width – Local Facility

301.2 Class II Bikeway Lane Width

301.3 Cross Slopes

301.3 Algebraic Differences in Cross Slopes

Topic 302 Shoulder Standards

Index 302.1 Shoulder Width

301.2 Shoulder Width with Rumble Strip

302.2 Shoulder Cross Slopes

Topic 305 Median Standards

Index 305.1 Median Width – Conventional Highways(1)

305.1 Median Width – Freeways and Expressways(1)

Topic 307 Cross Sections for State Highways

Index 307.2 Shoulder Standards for Two-lane Cross Sections for New Construction

(1) Caltrans-only Mandatory Standard.

(2) Authority to approve deviations from this Mandatory Standard is delegated to the State Pavement Engineer.

Table 82.1A
Mandatory Standards (Cont.)

Topic 308		**Cross Sections for Roads Under Other Jurisdictions**
Index	308.1	Cross Section Standards for City Streets and County Roads without Connection to State Facilities
	308.1	Minimum Width of 2-lane Over-crossing Structures for City Streets and County Roads without Connection to State Facilities
	308.1	Cross Section Standards for City Streets and County Roads with Connection to State Facilities
	308.1	Shoulder Width Standards for City Streets and County Roads with Curbs or Other Lateral Obstructions
	308.1	Minimum Width for 2-lane Overcrossing at Interchamges
Topic 309		**Clearances**
Index	309.1	Horizontal Clearances and Stopping Sight Distance
	309.1	Clear Recovery Zone
	309.1	Horizontal Clearances
	309.2	Vertical Clearances - Major Structures
	309.2	Vertical Clearances - Minor Structures
	309.2	Vertical Clearances - Rural and Single Interstate Routing System
	309.3	Horizontal Tunnel Clearances
	309.3	Vertical Tunnel Clearances
	309.4	Lateral Clearance for Elevated Structures(1)
	309.5	Structures Across or Adjacent to Railroads - Vertical Clearance
Topic 310		**Frontage Roads**
Index	310.1	Frontage Road Width Cross Section(1)

CHAPTER 400 INTERSECTIONS AT GRADE

Topic 404		**Design Vehicles**
Index	404.2	Design Vehicle – Traveled Way
Topic 405		**Intersection Design Standards**
Index	405.1	Corner Sigh Distance – Driver Set Back
	405.1	Corner Sight Distance at Public Road Intersections
	405.1	Corner Sight Distance at Private Road Intersections
	405.2	Left-turn Channelization - Lane Width
	405.2	Two-way Left-turn Lane Width
	405.3	Right-turn Channelization – Lane and Shoulder Width

CHAPTER 500 TRAFFIC INTERCHANGES

Topic 501		**General**
Index	501.3	Interchange Spacing
Topic 502		**Interchange Types**
Index	50.2	Isolated Off-Ramps and Partial Interchanges
Topic 504		**Interchange Design Standards**
Index	504.2	Location of Freeway Entrances & Exits
	504.2	Ramp Deceleration Lane and “DL” Distance
	504.3	Ramp Lane Width
	504.3	Ramp Shoulder Width
	504.3	Ramp Lane Drop Taper Past the Limit Line
	504.3	Metered Multi-Lane Ramp Lane Drop Taper Past the Limit Line
	504.3	Ramp Meters on Connector Ramps
	504.3	Lane Drop Transitions on Connector Ramps

(1) Caltrans-only Mandatory Standard.

(2) Authority to approve deviations from this Mandatory Standard is delegated to the State Pavement Engineer.

Table 82.1A
Mandatory Standards (Cont.)

504.3	Distance Between Ramp Intersection and Local Road Intersection
504.4	Freeway-to-freeway Connections - Shoulder Width – 1 and 2-Lane
504.4	Freeway-to-freeway Connections - Shoulder Width – 3-Lane
504.7	Minimum Weave Length
504.8	Access Control along Ramps
504.8	Access Control at Ramp Terminal
504.8	Access Rights Opposite Ramp Terminals
504.8	Access Rights Opposite Ramp Terminals

CHAPTER 610 PAVEMENT ENGINEERING CONSIDERATIONS

Topic 612 Pavement Design Life

Index 612.2	Design Life for New Construction and Reconstruction[(1), (2)]
612.3	Pavement Design Life for Widening Projects[(1), (2)]
612.5	Pavement Design Life for Pavement Roadway Rehabilitation Projects[(1), (2)]

Topic 613 Traffic Considerations

Index 613.5	Traffic Loading Considerations[(1), (2)]

CHAPTER 620 RIGID PAVEMENT

Topic 622 Engineering Requirements

Index 622.4	Dowel Bars and Tie Bars for New or Reconstructed Rigid Pavements[(1), (2)]
Index 622.8	Transitions and Terminal Anchors for CRCP[(1), (2)]

Topic 625 Engineering Procedures for Pavement and Roadway Rehabilitation

Index 625.1	Limits of Paving on Resurfacing Projects[(1), (2)]

Topic 626 Other Considerations

Index 626.2	Tied Rigid Shoulder Standards[(1), (2)]
626.2	Tied Rigid Shoulders or Widened Slab Standards[(1), (2)]
626.2	Tied Rigid Shoulders or Widened Slab at Ramps and Gore Standard[(1), (2)]

CHAPTER 630 FLEXIBLE PAVEMENT

Topic 633 Engineering Procedures for New & Reconstruction Projects

Index 633.1	Enhancements for Pavement Design Life Greater Than 20 Years[(1), (2)]

Topic 635 Engineering Procedures for Flexible Pavement and Roadway Rehabilitation

Index 635.1	Limits of Paving on Resurfacing Projects[(1), (2)]

CHAPTER 640 COMPOSITE PAVEMENTS

Topic 645 Engineering Procedures for Pavement and Roadway Rehabilitation

Index 645.1	Limits of Paving on Overlay Projects[(1), (2)]

CHAPTER 700 MISCELLANEOUS STANDARDS

Topic 701 Fences

Index 701.2	Fences on Freeways and Expressways[(1)]

CHAPTER 900 LANDSCAPE ARCHITECTURE

Topic 902 Planting Guidelines

Index 902.3	Trees In Conventional Highway Medians, Distance From Longitudinal End of Median[(1)]
902.3	The Planting of Trees in Conventional Highway Medians, Less Than 35 mph Posted Speeds[(1)]

(1) Caltrans-only Mandatory Standard.

(2) Authority to approve deviations from this Mandatory Standard is delegated to the State Pavement Engineer.

Table 82.1A
Mandatory Standards (Cont.)

902.3	The Planting of Trees in Conventional Highway Medians, 45 mph or Less Posted Speeds(1)
902.3	The Planting of Trees in Conventional Highway Medians, Greater Than 45 mph Posted Speeds(1)
Topic 903	**Safety Roadside Rest Area Design Standards and Guidelines**
Index 903.5	Rest Area Ramp Design
Topic 904	**Vista Point Standards and Guidelines**
Index 904.3	Vista Point Ramp Design
CHAPTER 1000	**BICYCLE TRANSPORTATION DESIGN**
Topic 1003	**Design Criteria**
Index 1003.1	Class I Bikeway Widths(1)
1003.1	Class I Bikeway Shoulder Width(1)
1003.1	Class I Bikeway Horizontal Clearance(1)
1003.1	Class I Bikeway Structure Width(1)
1003.1	Class I Bikeway Vertical Clearance(1)
1003.1	Bike Paths Parallel and Adjacent to Streets and Highways
1003.1	Class I Bikeway in Medians(1)
1003.1	Class I Bikeway Design Speeds(1)
1003.1	Stopping Sight Distance
1003.1	Obstacle Posts or Bollards in Bicycle Paths
CHAPTER 1100	**HIGHWAY TRAFFIC NOISE ABATEMENT**
Topic 1102	**Design Criteria**
Index 1102.2	Horizontal Clearance to Noise Barrier
1102.2	Noise Barrier on Safety Shape Concrete Barrier

(1) Caltrans-only Mandatory Standard.

(2) Authority to approve deviations from this Mandatory Standard is delegated to the State Pavement Engineer.

Table 82.1B
Advisory Standards

CHAPTER 100 BASIC DESIGN POLICIES

Topic 101 Design Speed

Index 101.1 Selection of Design Speed - Local Facilities

101.1 Selection of Design Speed - Local Facilities - with Connections to State Facilities

101.2 Design Speed Standards

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